"A COMPARATIVE STUDY ON EFFECTIVENESS OF BUTEYKO BREATHING TECHNIQUE AND ACTIVE CYCLE OF BREATHING TECHNIQUE IN THE MANAGEMENT OF DYSPNOEA AMONG ASTHMA PATIENTS''

Dissertation submitted to

THE TAMIL NADU DR. M.G.R MEDICAL UNIVERSITY

Towards the partial fulfillment of the requirement for the degree of

MASTER OF PHYSIOTHERAPY

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CHERRAAN'S COLLEGE OF PHYSIOTHERAPY

CHERRAAN'S INSTITUTE OF HEALTH SCIENCES

COIMBATORE, TAMILNADU, INDIA

MAY-2018

CERTIFICATES

CERTIFICATE

This is to certify, that is the bonafide record of project work, done by candidate bearing University Registration Number 271730161 and submitted for the partial fulfillment of **MASTER OF PHYSIOTHERAPY** Degree course requirements at **CHERRAAN'S COLLEGE OF PHYSIOTHERAPY,** COIMBATORE, under **THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY** CHENNAI.

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Project work evaluated on _____

DECLARATION

DECLARATION

The work embodied in this project **entitled "A COMPARATIVE STUDY ON EFFECTIVENESS OF BUTEYKO BREATHING TECHNIQUE AND ACTIVE CYCLE OF BREATHING TECHNIQUE IN THE MANAGEMENT OF DYSPNOEA AMONG ASTHMA PATIENTS"** submitted to **THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI,** in partial fulfillment for the degree of **MASTER OF PHYSIOTHERAPY,** was the original work carried out by me and has not been submitted in part or full for any other degree/diploma at this or any other institute/university. All the ideas and references have been duly acknowledged.

_____ _____

Signature of supervisor Signature of student

Mr.V. Karthik MPT,MBA,PGDF,CMT,MIAP

Professor

Date: _____

ACKNOWLEDGEMENT

ACKNOWLEDGEMENT

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I take this opportunity to thank each & every PATIENTS who took part in this study for their kind co-operation & needed information.

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"A COMPARATIVE STUDY ON EFFECTIVENESS OF BUTEYKO BREATHING TECHNIQUE AND ACTIVE CYCLE OF BREATHING TECHNIQUE IN THE MANAGEMENT OF DYSPNOEA AMONG ASTHMA PATIENTS''

DESIGN: This study is a pre test and pos test experimental design comparative in nature.

PARTICIPATIONS: Twenty subject were selected treated with course buteyko breathing and active cycle of breathing technique.

Materials and Methods: Thirty both gender subjects who has been diagnosed as asthma with mean age 20-40 years were taken as subjects in the study. Parameter Modified Borg's dyspnoea scale and Peak expiratory flow rate noted prior to and following 6 session of intervention. All subjects were randomly divided in two group A and B with ten subject in each group GROUP A underwent Buteyko breathing .GROUP B underwent treatment of active cycle of breathing technique.

OUTCOME MEASURE: The outcome was measured by using Modified Borg's dyspnoea scale and Peak expiratory flow rate.

RESULT: There was significant improvement in reduction of dyspnoea and improve breathing pattern.

CONCLUSION : Buteyko breathing technique is found to be effective in reduction dyspnoea and to improve breathing pattern.

KEY WORDS: Buteyko breathing, Active cycle of breathing technique.

INTRODUCTION

CHAPTER-I

INTRODUCTION

Asthma is a chronic inflammatory condition of the airways that is characterised by an increased responsiveness of the airway smooth muscle to various stimuli. It is manifested by widespread narrowing of the airways that reverses either spontaneously or as a result of treatment **(Peter Lange, 1998)**.

Asthma is associated with airway hyper responsiveness that leads to recurrent episodes of wheezing, breathlessness, chest tightness and coughing particularly at night or in the early morning. These symptoms are usually associated with widespread but variable airflow limitation that is atleast partly reversible either spontaneously or with treatment. The inflammation also causes an associated increase in airway responsiveness to a variety of stimuli **(NIH)**.

There is a considerable global variation in the prevalence rates of asthma, with the highest rates reported in America, Australia and the United Kingdom. Much lower rates are reported in prevalence studies from Africa and Asia **(Ammani Prasad, 2008)**.

Asthma is certainly a widespread disease in the world today. Its incidence is about 3% to 7% in adults. It is found more often in individuals under age of 25, where estimates of prevalence vary from 5% to 15%. About 80% of children with asthma do not have asthma after the age of 10 **(Williams and McNicol, 1969)**.

The individual with an acute asthma attack usually has been awakened at night or early in the morning with one or more of the following symptoms cough, dyspnoea, wheezing, or chest tightness **(McFadden, 1988)**.

During the asthma attack the muscles around the airways tighten, and the airway linings swell excess mucus secretion is produced in the airways that can block the air tubes and lungs. When air is trapped, breathing becomes difficult. The airways are narrowed as a result of the inflammatory response cause wheezing.

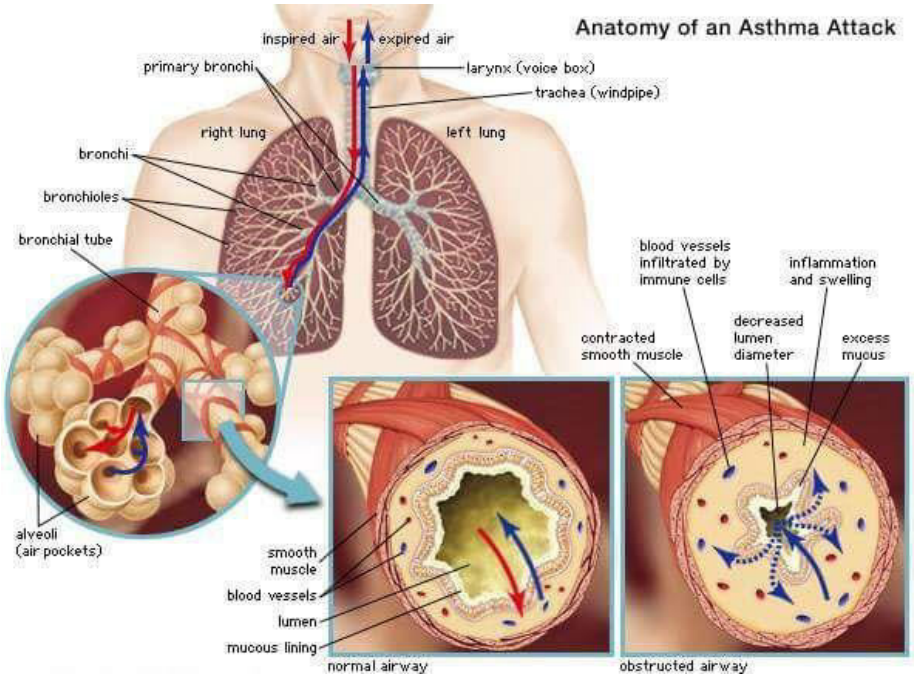


Figure 1: Shows anatomy of Asthma

There are several clinical classifications of asthma. Patients with asthma may be classified as being atopic or non-atopic. Atopic subjects have raised serum levels of total IgE antibody and specific IgE antibody in response to inhaled allergens such as grass pollens, house dust mite, and aspergillus, dog and cat danders. Non-atopic subjects do not have elevated total IgE levels in their serum it is possible that atopy and asthma are inherited independently **(Stark, 1990)**.

Both non-specific and specific agents can provoke asthmatic reactions in atopic and non-atopic subjects. Non-specific agents include upper respiratory tract infections, emotional factors, exercise, cold air, cigarette smoke and non-antigenic dusts. Specific agents include drugs, for example aspirin, and occupational agents such as isocyanides and epoxy resins **(Barbara A. Webber, 1995)**.

Extrinsic and intrinsic are others terms often used in the classification of asthma. Inhaled allergens are likely to provoke symptoms in extrinsic asthma and unlikely to provoke symptoms in intrinsic asthma. Extrinsic atopic asthma is found in subjects who have other features of atopy, for example hay fever or eczema, but several types of occupational asthma can be categorized as extrinsic non-atopic. Intrinsic asthma is usually of late onset in subjects who are non-atopic. Asthma in some subjects is provoked by exercise. **(Barbara A. Webber, 1995)**.

Clinical feature include: wheeze, breathlessness, tightness of the chest, and cough which occurs particularly at night and is often paroxysmal. The features may be episodic or persistent. Episodic asthma: this may range from mild episodes of wheeze, cough, and breathlessness to an acute severe attack. The severe attack is recognized by tachycardia, pulsusparadoxus, difficulty in completing sentences without pausing for breath, central cyanosis, and severe breathlessness-often with the patient sitting forward gasping for breath-which if not treated leads to exhaustion. The breath sounds during an attack would initially be wheezy. Persistent asthma: with this there is a little relief from symptoms and there may or may not be diurnal variations **(Barbara A. Webber, 1995)**.

In severe cases, asthma can be life threatening. Once affected by the trigger, the airways narrow increase in the resistance to airflow and reducing oxygen delivery. Breathing through narrow airways contributes to wheezing, reduced alveolar ventilation, rapid shallow breathing, and shortness of breath, increased work of breathing, desaturation, and cyanosis. Increased inhomogeneity of the distribution of ventilation is present in some non-acute asthmatic patients. Although some triggers may produce mucous hyper secretion, even normal amounts of pulmonary secretion can obstruct narrowed airways leading to atelectasis **(Ross *et al*, 1992)**.

Measurement of airflow obstruction: The peak expiratory flow meter can be used to observe patterns of airflow obstruction overtime. Several patterns have been recognised; the brittle asthmatic, the morning dipper and the irreversible asthmatic **(Turner-Warwick, 1977)**.

Arterial blood gases: Blood gas analysis is important in all asthmatic patients, admitted to hospital or an emergency department, with deterioration in their condition **(British Thoracic Society 1993)**.

Chest radiograph: Hyperinflation is a characteristic of severe asthma, but the chest radiograph is also necessary to exclude a pneumothorax or pneumomediastinum.

Sputum: Sputum is usually mucoid but may be mucopurulent. In asthma associated with infection the sputum should be cultured to identify infecting organisms. The presence of eosinophils in the sputum is common in asthma and large number of eosinophils will give the sputum an opaque appearance and may colour it yellow or green.

Haematology: Blood eosinophilia is common. In atopic asthma, but may also occur in some non-atopic subjects. Total IgE levels in the serum are raised in atopic asthmatics.

Skin-prick tests: Solutions containing various antigenic materials can be pricked into the dermis of the forearm and a positive response is indicated when a weal of more than 2 mm diameter is present after 10-20 min.

Bronchial challenge tests: Non-specific chemicals, histamine or metacholine can be used to investigate airway hyper reactivity. Patients with asthma react to these agents at lower concentrations than do normal subjects, but false-positive results may be obtained. Bronchial provocation tests may be carried out in the investigation of occupational allergens **(Cramer, 1992)**.

Peak expiratory flow is defined as the maximal flow achieved during expiration delivered with a maximal force starting from maximal lung function. In normal subjects PEFR is determined by: The size of the lungs, Lung elasticity, the dimensions and compliance of the central intra-thoracic airways, the strength and speed of the contraction of the respiratory muscles. The normal values relate to the height and gender of the child. PEFR must be ascertained separately using a peak flow meter **(Rosenthal *et al,* 1993)**.

Borg's rating of perceived exertion is often used as a means of prescribing exercise intensity for patients with cardiovascular and pulmonary diseases. Using the rating of perceived exertion scale allows the patient to self-regulate exercise intensity based on his or her perception of exertion. Rating of perceived exertion has been correlated with VO_2, making it a useful means of prescribing and monitoring exercise intensity

Medical management: The goals of medical management are to abolish symptoms, to restore normal lung function and to minimize the risk of a severe attack. There are asthmatics who have only occasional mild attacks, some who have acute severe episodes and others with chronic persistent asthma. Drug therapy includes bronchodilators (β_2 agonists, anticholinergics, xanthines), and anti-inflammatory agents **(British Thoracic Society 1993)**.

Physiotherapy management: Physiotherapists should also be able to advice on exercise, which is important in the asthmatic child to maintain general fitness. Improvements in aerobic capacity following exercise programmes have been documented in asthmatic patients, but there is no clear evidence to suggest that exercise training can influence the dose of medication required or improve asthma control in some other way **(Carrol& Sly, 1999)**.

The Buteyko breathing technique is spreading in Australia, New Zealand and United Kingdom. The technique is based on the theory that hyperventilation is a major cause of asthma and the technique of reducing the depth and frequency of respiration and of breath holding is taught, together with other input. It seems to be based on a similar understanding of the need to up regulate the $PaCO_2$ levels. The regimen appears to be a fixed formula, which is imposed on everyone in the group. The training occurs over 7 days; each session lasts 60-90 minutes and consists **(Ammani Prasad, 2008)**.

Effective physiotherapy should reduce the episodes of superimposed infection and may help to minimize further lung damage. An airway clearance technique (ACT), for example the active cycle of breathing technique (ACBT) or autogenic drainage (AD), should be introduced and self treatment encouraged. Other techniques that may be used to facilitate airway clearance have proven efficacy when used in gravity-assisted positions, e.g. Flutter and ACBT and Acapella(**Rosen 2006**).

The active cycle of breathing techniques (ACBT) has been shown to be effective in the clearance of bronchial secretions and to improve lung function without increasing hypoxemia or airflow obstruction. It is a cycle of breathing control, thoracic expansion exercises and the forced expiration technique **(Pryor, 1994).**

1.1 STATEMENT OF THE STUDY:

A study to find out and compare the effectiveness of Buteyko breathing technique (BBT) and Active cycle of breathing Exercise (ACBT) in the management of dyspnoea , which was measured by modified Borg's scale and peak expiratory flow meter among the patients with asthma.

1.2 NEED OF THE STUDY:

The rehabilitation program for the patient with plantar fasciitis have been discussed in several articles few studies onbuteyko breathing technique and Active cycle of breathing Exercise in the management of dyspnoea among patients with asthma like Andripriyatna., (2012)A total of 68 patients with moderate and severe asthma were included according to Global Initiative for Asthma (GINA) criteria. All patients were randomized into a physical training group; (N= 38), while another group did not join exercise training (control group; N =30). Physical training can improve HRQOL and pulmonary function in patients with moderate and severe bronchial asthma. Exercise prescription should be integrated as an essential treatment of asthmatic patients.

Shereen(2015)conducted a study over 45 patients with COPD. They were divided into two groups. Group A received ACBT and Group B received conventional chest physiotherapy. The pre and post treatment measures were recorded for functional capacity in the form of 6 minute walk test and dyspnoea index. It was concluded that ACBT is an effective method for airway clearance and improving functional capacity in patients with COPD in which chronic bronchitis is one of the condition.

Shine(2016)conducted a study over 100 students of age group 7 – 15years. After anthropometric examination PEFR values are recorded. Flow meter after demonstrating them the right procedure. It was concluded that the result of this study support the vital role of PEFR related to changes in airflow, which eventually can result in early identification of children with airway obstruction.

Joshi Rashmi(2017)conducted a study over 70subjects who were selected. Among them 50 subjects with dyspnoea score more than 3 were administrated. They received breathing exercises twice a day for 5 continuous days. It was measured using modified Borg scale for dyspnoea. It was concluded that the findings of the study shows effectiveness in improving dyspnoea patients.

Kolb(2003)conducted a study on 38 people with asthma aged between 18 and 70. Participants were followed for six months following the intervention. No significant change in FEV1 (forced expiratory volume in one second) was recorded in either group. The BBT group exhibited a reduction in inhaled steroid use of 50% and beta2- agonist use of 85% at six months from baseline. Buteyko breathing technique is safe and efficacious asthma management technique. BBT has clinical and potential pharmaco-economic benefits.

There is a lack of evidence to reduce dyspnoea which in turn will improve the breathing pattern with asthma.Thus this study will give a evidence to improve breathing pattern, dyspnoea which in turn will improve breathing pattern with asthma.

1.3 AIM:

A study to find and compare the effect ofButeyko breathing technique (BBT) and Active cycle of breathing Exercise (ACBT) in the management of dyspnoea , which was measured by modified Borg's scale and peak expiratory flow meter among the patients with asthma.

1.4 OBJECTIVE OF THE STUDY:

- To determine the effectiveness of Buteyko breathing technique in the management of level of dyspnoea among patients with asthma.
- To determine the effectiveness of in the management of Active cycle of breathing Exercise level of dyspnoea among patients with asthma.
- To systematically the effectiveness of Buteyko breathing technique andActive cycle of breathing Exercise in the management of level of dyspnoea among the patients with asthma.

1.5 HYPOTHESIS:

The following hypotheses are framed for this study

NULL HYPOTHESIS:

1. It is hypothesized that there is no significant difference in level of dyspnoea in subject with asthma who receive buteyko breathing technique.
2. It is hypothesized that there is no significant difference in level of dyspnoea in subject with asthma who receive active cycle of breathing exercise.
3. It is hypothesized that there is no significant difference in between buteykobreathing andActive cycle of bretathing Exercise to reduce level of dyspnoea and improve breathing pattern in subject with asthma.

ALTERNATIVE HYPOTHESIS:

1. It is hypothesized that there is significant difference in level of dyspnoea in subject with asthma who receive buteyko breathing technique.
2. It is hypothesized that there is significant difference in level of dyspnoea in subject with asthma who receive active cycle of breathing exercise.
3. It is hypothesized that there is significant difference in between buteyko breathing and Active cycle of bretathing Exercise to reduce level of dyspnoea and improve breathing pattern in subject with asthma.

1.6 OPERATIONAL DEFINITION:

ASTHMA:

Asthma is a chronic inflammatory condition of the airways that is characterised by an increased responsiveness of the airway smooth muscle to various stimuli. It is manifested by widespread narrowing of the airways that reverses either spontaneously or as a result of treatment **(Peter Lange, 1998)**.

BUTEYKO BREATHING TECHNIQUE:

The Buteyko breathing technique is spreading in Australia, New Zealand and United Kingdom. The technique is based on the theory that hyperventilation is a major cause of asthma and the technique of reducing the depth and frequency of respiration and of breath holding is taught, together with other input. It seems to be based on a similar understanding of the need to upregulate the $PaCO_2$ levels. The regimen appears to be a fixed formula, which is imposed on everyone in the group. The training occurs over 7 days; each session lasts 60-90 minutes and consists **(Ammani Prasad, 2008)**.

ACTIVE CYCLE OF BREATHING TECHNIQUE:

The active cycle of breathing techniques (ACBT) has been shown to be effective in the clearance of bronchial secretions and to improve lung function without increasing hypoxemia or airflow obstruction. It is a cycle of breathing control, thoracic expansion exercises and the forced expiration technique **(Pryor *et al*, 1994).**

PEAK EXPIRATORY FLOW RATE:

Peak expiratory flow is defined as the maximal flow achieved during expiration delivered with a maximal force starting from maximal lung function. In normal subjects PEFR is determined by: The size of the lungs, Lung elasticity, the dimensions and compliance of the central intra-thoracic airways, the strength and speed of the contraction of the respiratory muscles. The normal values relate to the height and gender of the child. PEFR must be ascertained separately using a peak

MODIFIED BORG DYSPNOEA SCALE:

Rating of perceived exertion (RPE) is a widely usedand reliable indicator to monitor and guide exerciseintensity. The scale allows individuals to subjectivelyrate their level of exertion during exercise or exercisetesting. Developed by Gunnar Borg, it is often also referredto as the Modified Borg Scale **(American college of sports medicine, 2010).**

REVIEW OF LITERATURE

CHAPTER- II

REVIEW OF LITERATURE

SECTION A: Studies related to general aspect of asthma.

SECTION B: Studies related to Buteyko breathing technique on asthma.

SECTION C: Studies related to Active cycle of breathing technique on asthma.

SECTION D: Studies related to peak expiratory flow meter on asthma.

SECTION E: Studies related to Modified Borg Dyspnoea scale.

SECTION A: Studies related to general aspect of asthma.

Andripriyatna., (2012)

A total of 68 patients with moderate and severe asthma were included according to Global Initiative for Asthma (GINA) criteria. All patients were randomized into a physical training group; (N= 38), while another group did not join exercise training (control group; N =30). Physical training can improve HRQOL and pulmonary function in patients with moderate and severe bronchial asthma. Exercise prescription should be integrated as an essential treatment of asthmatic patients.

Asmadi(2008)

A review was performed on the terms breathing exercises (BE), inspiratory muscle training (IMT), physical training and airway clearance (AC) in patients with asthma. The search resulted in 237 potentially relevant articles, after exclusion 23 articles remained. BE (n Z 9) may improve disease specific quality of life (QoL), reduce symptoms, hyperventilation, anxiety and depression, lower respiratory rate and medication use. IMT (n Z 3) can improve inspiratory pressure and may reduce medication use and symptoms. (n Z 12) can reduce symptoms, improve QoL and improve cardiopulmonary endurance and fitness. In conclusion, physiotherapy may improve breathing pattern.

Bull (2007)

The study was cohort design included 38 patients (mean age 41.131±14.711) of both genders with mild to moderate asthma. Each patient received multiple sessions (3times/week for one month) of active cycle of breathing technique. Pre and post-treatment measures were recorded for functional capacity and health-related quality of life in the form of six-minute walk test and standardized airway questionnaire. All 38 patients were stable during the study period. The health-related quality of life and functional capacity of patient significantly improved post-treatment sessions with means [205.375±93.594 for week 1, 1248.719±112.187 for week 2, 306.429±140.5554 for week 3, 337.245±134.389 for week 4], for six-minute wall test and mean difference 4.13± 2.3SD for standardized airway questionnaire with p-value (0.00) significant upon paired t-test. It is concluded that the active cycle of breathing technique is very beneficial intervention for improving quality of life and functional capacity of patients with mild to moderate asthma

SECTION B: Studies related to Buteyko technique on asthma

Dupler (2012)

Theconducted a study on 39 subjects with asthma. Subjects recruited from the community, aged 12 to 70 years, with asthma and substantial medication use. Morning peak expiratory flow rate, forced expiratory volume in one second. End-tidal CO_2, resting minute volume, quality of life score, measured at three months. No change in daily PEF or FEV1 was noted in either group. At three months, the BBT group had a median reduction in daily beta 2-agonist dose of 904 micrograms, whereas the control group had a median reduction of 57 micrograms. Those practicing BBT reduced hyperventilation and their use of beta 2-agonists. A trend toward reduced inhaled steroid use and better quality of life was observed in these patients without objective changes in measures of airway calibre.

Robert L Cowie., (2007)

A randomised controlled trial of buteyko technique in a group of adults with asthma. The control group was trained by a physiotherapist in breathing and relaxation techniques. A single centre associated with a university based asthma programme. Asthma control, defined by composite score based on the Canadian asthma consensus report 6 months after completion of intervention. Both group showed substantial and similar improvement. In the buteyko group the proportion with asthma control increased from 40% to 72%. In addition the buteyko group had significantly reduced their inhaled corticosteroid therapy compared with the control group.

Kolb *et al.*, (2003)

The conducted a study on 38 people with asthma aged between 18 and 70. Participants were followed for six months following the intervention. No significant change in FEV1 (forced expiratory volume in one second) was recorded in either group. The BBT group exhibited a reduction in inhaled steroid use of 50% and beta2- agonist use of 85% at six months from baseline. Buteyko breathing technique is safe and efficacious asthma management technique. BBT has clinical and potential pharmaco-economic benefits

SECTION C: Studies related to Active Cycle of Breathing Technique on asthma.

Shereen(2015)

Theconducted a study over 45 patients with COPD. They were divided into two groups. Group A received ACBT and Group B received conventional chest physiotherapy. The pre and post treatment measures were recorded for functional capacity in the form of 6 minute walk test and dyspnoea index. It was concluded that ACBT is an effective method for airway clearance and improving functional capacity in patients with COPD in which chronic bronchitis is one of the condition.

Thompson (2015)

The conducted a study over 17 stable patients with chronic bronchitis which is one of the condition of COPD. 4 weeks of daily ACBT compared with 4 week of Flutter device. Group A received ACBT and whereas Group B received flutter for 4 weeks of intervention. It was measured using PEFR, sputum weight, lung function test, etc. It was concluded that ACBT is more effective than Flutter in patients with COPD.

Senthil(2015)

Theconducted a study over 30 subjects and randomly divided into experimental and control group. Each group consists of 15 subjects. The experimental group attended 30 minutes of ACBT treatment session for 30 days, and control group didn't participate in any session, then FEV1 and FVC were determined as outcome measures using a standard method. It was concluded that ACBT can improve airway clearance and breathing.

Halim*et*(2015)

Theconducted a study over 30 subjects all having COPD. The subjects underwent conventional chest physiotherapy or ACBT following postural drainage as the airway clearance technique. Group A received conventional chest physiotherapy and Group B received ACBT.It was concluded that ACBT with postural drainage is found to be more effective than conventional chest physiotherapy in the management of COPD.

Puneeth(2012)

The conducted a randomized experimental study with 30 subjects who have COPD. 15 subjects underwent postural drainage and 15 subjects underwent ACBT. Pre and post evaluation were done with FVC, FEV1, PEFR and SPO2 with pulmonary function tests. It was concluded that even though both ACBT and postural drainage have significant effect in clearing airways in patients with chronic bronchitis. ACBT has a better effect in clearing the airways than postural drainage and by improving pulmonary function in patients with COPD.

SECTION D: Studies related to peak expiratory flow rate on asthma.

Shine (2016)

Theconducted a study over 100 students of age group 7 – 15years. After anthropometric examination PEFR values are recorded. Flow meter after demonstrating them the right procedure. It was concluded that the result of this study support the vital role of PEFR related to changes in airflow, which eventually can result in early identification of children with airway obstruction.

Patricia Inaci(2015)

Theconducted a study over 32 patients diagnosed with non-CF bronchiectasis. During the study, patients were measured their PEFR every day and were asked to annotate all their symptoms. It was concluded that their findings substantiate the importance of PEFR and patient symptom daily registries as important tools to define and monitor exacerbations with overall patients health status.

Simon E Brill(2015)

Theconducted prospective observational cohort study of 32 out patients with non-CF bronchiectasis. Patients computed a symptom diary card and measured their PEFR daily. Symptoms and peak flow at exacerbations were analyzed. It was concluded that exacerbations of non-CF bronchiectasis are inflammatory events with worsened symptoms lung function and health status and a prolonged recovery period. Symptom diary cards, PEFR are responsible to changes at exacerbations and may be useful tools for their direction and monitoring.

Virendrasingh(2012)

Theconducted a study over 11 patients with bronchiectasis. Ten healthy matched control subjects were also selected to pair with these patients. Bronchodilator reversibility test was done initially and PEFR was measured for duration of 1 week by patients themselves on a chart that was given to them. The mean amplitude percentages of these records wereanalyzed. It was concluded that both reversibility and diurnal peak flow variability were higher in patients with various lung diseases compared with normal healthy subjects. Significant peak flow rate was present in bronchiectasis.

Friedo W. Dekker (1992)

Theconducted a study over 73 general practice patients and PEF measurements were performed. Relative operating characteristic analysis showed that an absolute improvement in PEF of 60 l/min. It was concluded that absolute change in PEF can be used as a simple techniques to diagnose reversible airflow obstruction in patients from general practice.

SECTION E: Studies related to Modified Borg's scale.

Joshi Rashmi(2017)

Theconducted a study over 70subjects who were selected. Among them 50 subjects with dyspnoea score more than 3 were administrated. They received breathing exercises twice a day for 5 continuous days. It was measured using modified Borg scale for dyspnoea. It was concluded that the findings of the study shows effectiveness in improving dyspnoea patients.

Paolo T. Pianosi(2016)

Theconducted a study over 41 subjects with the problem of dyspnoea. It is most commonly measured using modified Borg scale or VAS. Dyspnoea and perceived exertion ratings obtained with both modified Borg CR10 and Dalhousie scales during maximal cycle exercises were compared in 24 healthy adults and 17 with various pulmonary diseases. It was concluded that the Borg's scale for measuring dyspnoea showed good alternative to Dalhousie scales.

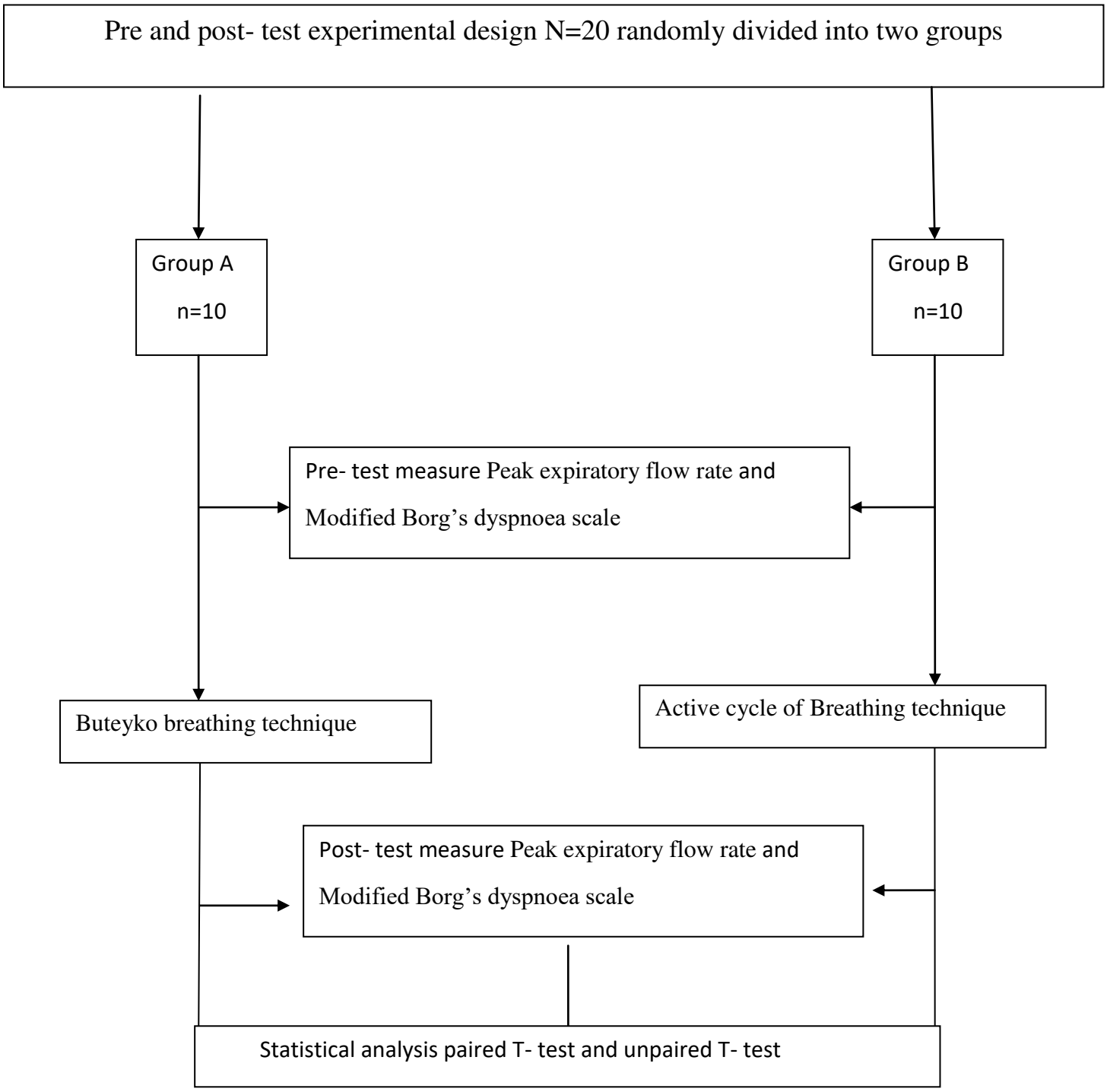
Yi- langchen(2013)

Theperformed a study over 12 participants. The objective of this study was to assess the relationship between Borg's RPE and heart rates. Three exercises types were performed by 12 participants under the test conditions of the three load levels for each exercise. The effect of familiarity on the relationship between RPE and heart rate were examined. The heart rate has lower correlation with RPE values. It was concluded that the findings may serve as a reference when using RPE scale and it is as effective as Heart rate.

MATERIALS AND METHODOLOGY

CHAPTER-III

III.MATERIALS AND METHODOLOGY



3.1 STUDY DESIGN:

The study was a pre – test and post –test experimental design comparative in nature.

3. 2 STUDY SETTING:

The study was conducted in the outpatient department of cherraan's Institute of health sciences - department of physiotherapy, Coimbatore.

3.3 STUDY DURATION:

The study was conducted for a period of 6 months.

3.4 SAMPLE METHODS:

The subject were selected by simple random sampling methods.

3.5 SUBJECTS:

A total number of twenty subjects were selected in the outpatient of cherraan's Institute of health sciences department of physiotherapy in simple sampling method by who fulfilled the inclusion criteria for this study. Out of them 10 were randomly assigned to group A forButeyko breathing techniqueand other 10 were assigned to group Bfor active cycle of breathing exercise.

3.6 CRITERIA FOR SELECTION OF SUBJECTS:

INCLUSION CRITERIA

- Subject with the age group of 20-40 years.
- Subject were selected in both gender.
- Subject with history of asthma for 2 years
- Subject with Clinically diagnosed patient with asthma.
- Subject who were clinically stable before study.

EXCLUSION CRITERIA

- Subject with epileptic.
- Subject with mental retarded.
- Subject with acute respiratory infection.
- Subject with cardiac diseases.
- Subject with recent surgery.
- Subject who have cardiac and neurological problem

3.7 VARIABLES:

Independent Variable:

- Buteyko breathing technique
- Active cycle of Breathing technique

Dependent variable:

- Forced expiratory volume
- Level of dyspnoea

3.8MEASUREMENT TOOL:

- Peak expiratory flow rate
- Modified Borg's dyspnoea scale

3.9MATERIAL USED IN THE STUDY:

- Pillow
- Couch
- Towel
- Client consent form
- Evaluation chart
- Chair
- Bed sheet
- Peak expiratory flow meter
- Modified Borg scale form

ORIENTATION OF THE SUBJECTS:

Before the treatment all the subjects were explained about this study and the procedure to be applied. They were asked to inform if they feel any discomfort during the course of study. Written consent was obtained from the subjects.

3.10 PROCEDURE:

Test administration

Forced expiratory volume is measured by peak flow meter. Forced expiratory volume is the maximal flow achieved during an expiration delivered with a maximal force starting from maximal lung function. It consists of three zones named as Green zone, Yellow zone, Red zone; whereas green zone indicates that the asthma is under good control, yellow zone indicates caution which means respiratory airways are narrowing, red zone indicates emergency which means severe airway narrowing.

b) Breathing pattern assessed by Modified Borg's dyspnoea scale

Rating of perceived exertion is a widely used and reliable indicator to monitor and guide exercise intensity. The scale allows individuals to subjectively rate their level of exertion during exercise or exercise testing. The original Borg scale or category scale (6 to 20 scale), and the revised category-ratio scale (0 to 10 scale). The original scale was developed in healthy individuals to correlate with exercise heart rates and to enable subjects to better understand terminology. RPE scales are particularly valuable when HR measures of exercise intensity are inaccurate or dampened, such as in patients on beta blocker medication. This is due to the scales ability to capture the perceived exertion from central cardiovascular, respiratory and central nervous system functions.

Figure 1: Shows measurement of forced expiratory volume

3.11 Treatment procedure

Group A: Buteyko breathing technique

Group B: Active cycle of breathing exercise

Group A

Buteyko breathing technique

Patient position:

Lying, sitting, half lying.

Therapist position:

Walk standing position.

Procedure:

Buteyko breathing technique consists of 3 steps

Step 1: The "control pause" Breathing test. Subject was instructed for breath holding as long as the subject feels comfortable. The goal is to be able to hold it for at least 60 seconds.

Step 2: Shallow breathing phase – subject is instructed to take shallow breaths, only through nose, keeping the mouth shut for 5 minutes. Then after the 5^{th} exhalation, control pause test is repeated, and the time of control pause is recorded for any improvement

Step 3: Putting it together i.e. "test-breath-test" routine is repeated 5 times in a row. This training session was repeated 2 times a day, every day for six weeks. .

Figure 2: Shows buteyko breathing

Group BActive cycle of breathing technique:

Patient position:

Sitting, lying or side lying.

Therapist position:

Walk standing position.

Procedure:

Active cycle of breathing technique can be performed in sitting, lying or side-lying positions. Initially, should start in a sitting position until comfortable and confident to try different ones. Extensive evidence supports its effectiveness in sitting or gravity assisted positions. A minimum of ten minutes in each productive position is recommended. The ACBT may be performed with or without an assistant providing vibration, percussion and shaking. Self percussion/compression may be included by the patient.

Breathing control technique:

The patient is asked to breathe in and out gently through nose if can. If not, breathe through mouth instead. Ask the patient to let go of any tension in body with each breath out and keep shoulders relaxed. Gradually make the breaths slower. The patient is asked to close the eyes to help to focus on breathing and to relax. Breathing control should continue until the person feels ready to progress to the other stages in the cycle.

Figure 3: Shows breathing control exercises

Thoracic expansion exercises:

The patient is asked to keep the chest and shoulders relaxed. The patient now takes a long, slow, deep breath in, through nose if can. At the end of the breath in, hold the air in lungs for 2-3 seconds before breathing out (this is known as an inspiratory hold). Breathe out gently and relaxed, like a sigh. Repeat 3 – 5 times. If the patient feels light headed then it is important that they revert back to the breathing control phase of the cycle.

Figure 4:ShowsThoracic expansion exercise

Forced Expiratory Technique:

The patient is asked to Huff and cough at different, controlled lengths to move mucus up to the larger airways. This huffing should be repeated until all mucus has been huffed out of the lungs.

Figure 5: Shows forced expiratory technique

Treatment duration:

20 minutes, per session

Collection of data

The selected 20 asthma subjects were divided into 2 groups.

Group A-Buteyko breathing technique

Group B- Active cycle of breathing exercise

Both the experimental groups were given treatment for continues 1 week. Before and after the completion of 1 week treatment intervention,pain was evaluated by spirometer and modified Borg dyspnoea scale was recorded.

TECHNIQUE OF DATA ANALYSIS:

The improvement in the increasing of range of motion was calculated by using the pre-test and post- test taken before and after treatment. The data obtained are analyzed using paired t-test.

MEAN

$$\bar{d} = \sum \frac{d}{n}$$

STANDARD DEVIATION

$$SD = \sqrt{\sum \frac{(d-\overline{d})^2}{n-1}}$$

PAIRED "t" TEST

$$t = \frac{\bar{d}\sqrt{n}}{S.D}$$

Where,

$\bar{d}$ = calculated mean difference pre-test and post-test.

n = sample size.

SD = standard deviation.

d = difference between pre and post-test.

UNPAIRED “t” TEST

The unpaired t -test was used to compare the statistical significant difference between group A and group B

FORMULA

$$s = \sqrt{\frac{(n_1-1){s_1}^2+(n_2-1){s_2}^2}{n_1+n_2-2}}$$

$$t = \frac{\bar{x}_1-\bar{x}_2}{s\sqrt{\frac{1}{n_1}+\frac{1}{n_2}}}$$

n_1 = total number of subject in group A.

n_2 = total number of subject in group B.

x_1 = difference between pre-test & post-test values of group A.

x_2 =difference between pre-test & post-test values of group B.

$\bar{x}_1$ = mean difference between pre-test & post-test value of group A

$\bar{x}_2$ = mean difference between pre-test & post-test value of group B.

DATA ANALYSIS

CHAPTER-IV

DATA ANALYSIS

The parameters were assessed in both group A (Buteyko breathing technique) having 10 subjects (n=10) and in group B (Active cycle of breathing exercise technique) having 10 subjects (n=10).

The pre-test and post-test assessments were taken subjects of the groups. The samples were assessed initially and then again at the end of the 4thweek.

STATISTICAL ANALYSIS USING PATIENTS T-TEST WAS PERFORMED TO COMPARE:

The pre-test and post-test scores of Peak expiratory flow rate and Modified Borg's dyspnoea scalein group A as well as in group B subjects. The mean difference of Peak expiratory flow rate and Modified Borg's dyspnoea scalein group A and group B subjects.The result obtained from the statistical analysis is provided here follow.

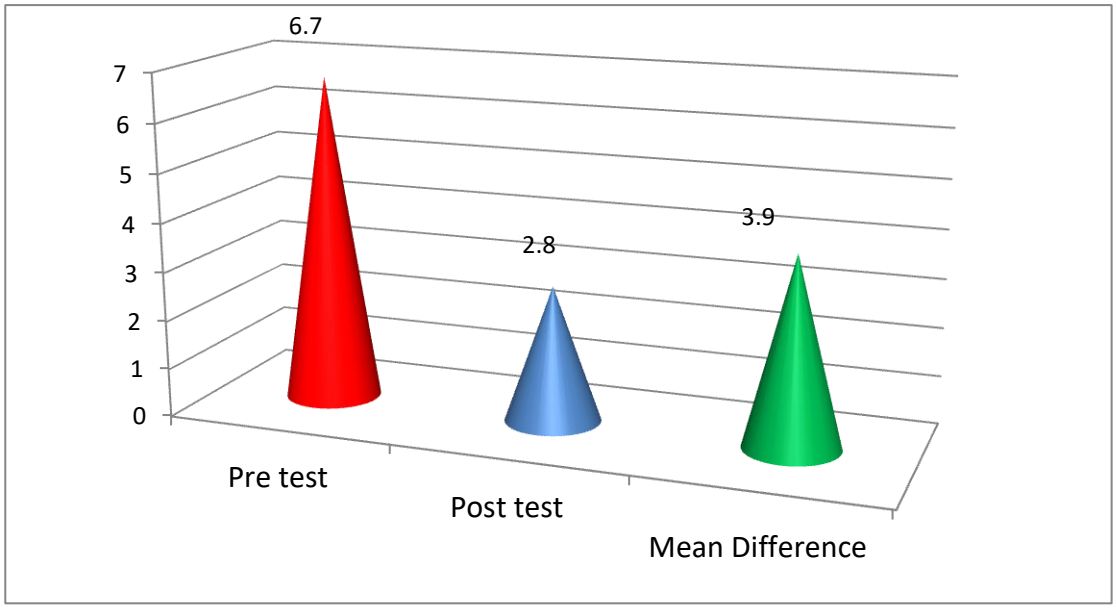
TABLE.1: Comparison of pre-test and post-test values of **scores of levels of dyspnoea among group-A** .

Group	Measurements	Mean	Mean difference	Standard deviation	Paired 't' test	Table 'p' value at 0.005
A	Pre test	6.7	3.9	0.73	16.8	3.250
	Post test	2.8				

The above table shows that out of 10 samples, pre & post-test mean, mean difference, standard deviation,'t' value of asthma.

Hence alternative hypothesis was accepted

GRAPH.1: Comparison of pre-test and post-test values of **scores of levels of dyspnoea among group-A** .



Shows graphical representation of pre and post- test mean values of level of dyspnoea among Group A

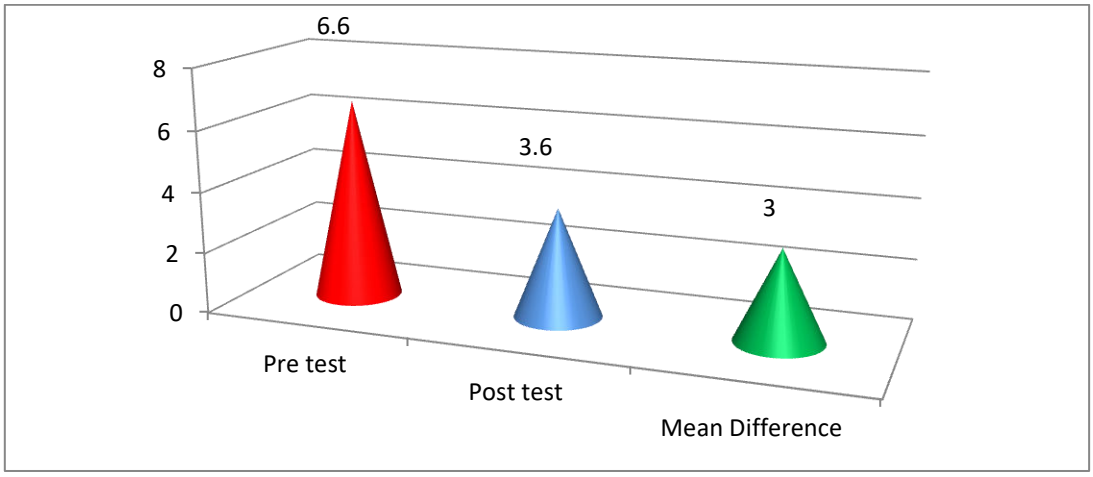
TABLE..2 Comparison of pre-test and post-test values of **scores of level of dyspnoea among group-B**

Group	Measurements	Mean	Mean difference	Standard deviation	Paired 't' test	Table 'p' value at 0.005
B	Pre test Post test	6.6 3.6	3.0	0.938	10.11	3.250

The above table shows that out of 10 samples, pre & post-test mean, mean difference, standard deviation,'t' value of asthma.

Hence alternative hypothesis was accepted

GRAPH. 2: Comparison of pre-test and post-test values of **scores of levels of dyspnoea among group-B** .



Shows graphical representation of pre and post- test mean values of level of dyspnoea among Group B

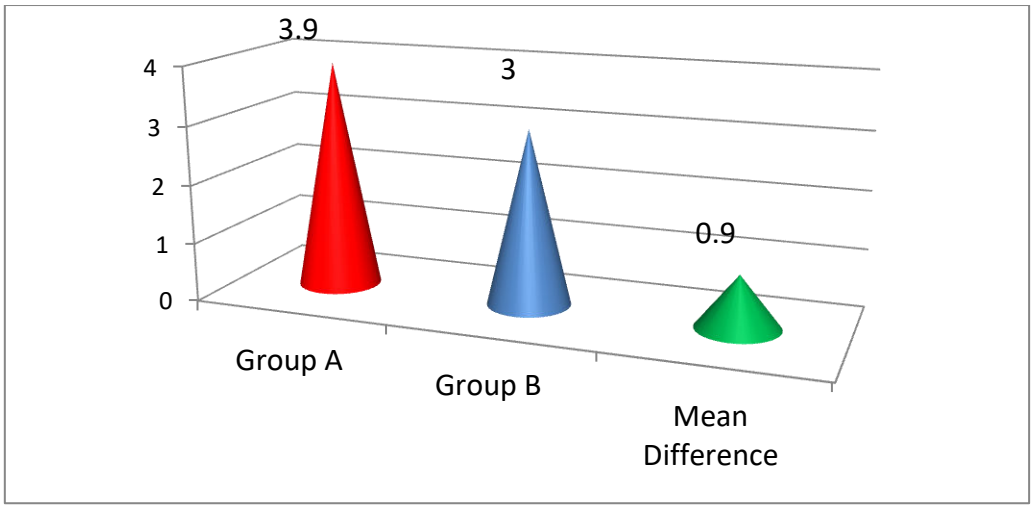
TABLE3: Mean value of**scores of level of dyspnoea between Group-A andGroup- B**

Groups	Mean	Mean difference	Standard deviation	Unpaired 't' test	Table 'p' value to 0.02
A	3.9	0.9	0.878	2.291	2.462
B	3.0				

The table shows that statistically difference in post-test values of asthma($p<0.02$).

Hence unpaired "t" test shows comparative effects of Group A then Group B.

GRAPH 3: Mean value of**scores of level of dyspnoea between Group-A andGroup- B**



Shows graphical representation of unpaired‘t’ value of level of dyspnoea between Group A and Group B.

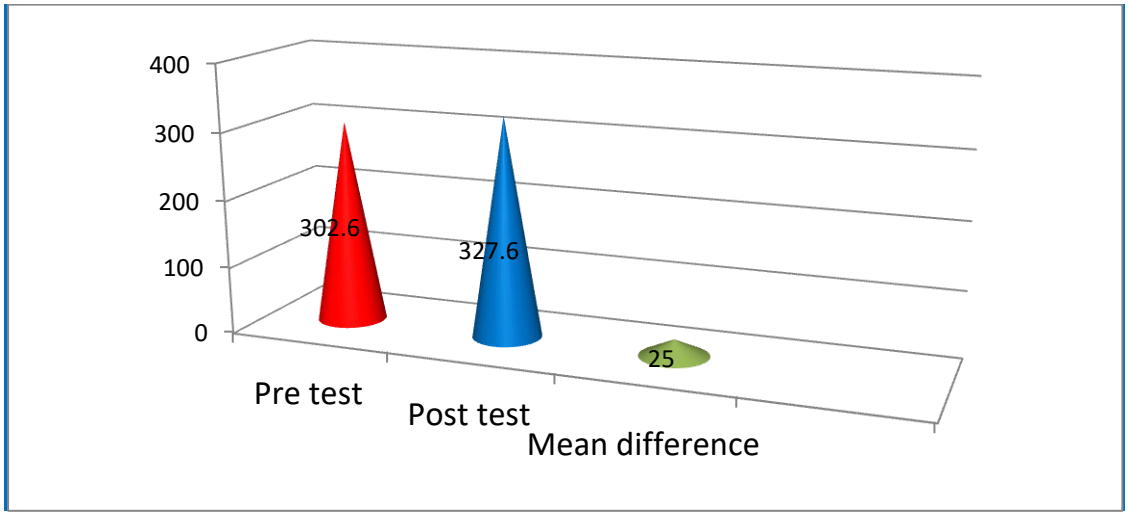
TABLE.4: Comparison of pre-test and post-test values of **scores of forced expiratory volume among group-A**

Group	Measurements	Mean	Mean difference	Standard deviation	Paired 't' test	Table 'p' value at 0.005
A	Pre test Post test	302.6 327.6	25	3.298	23.971	3.250

The above table shows that out of 10 samples, pre & post-test mean, mean difference, standard deviation,'t' value of asthma.

Hence alternative hypothesis was accepted

GRAPH .4: Comparison of pre-test and post-test values of **scores of forced expiratory volume among group-A**



Shows graphical representation of pre and post- test mean values of forced expiratory volume among Group A

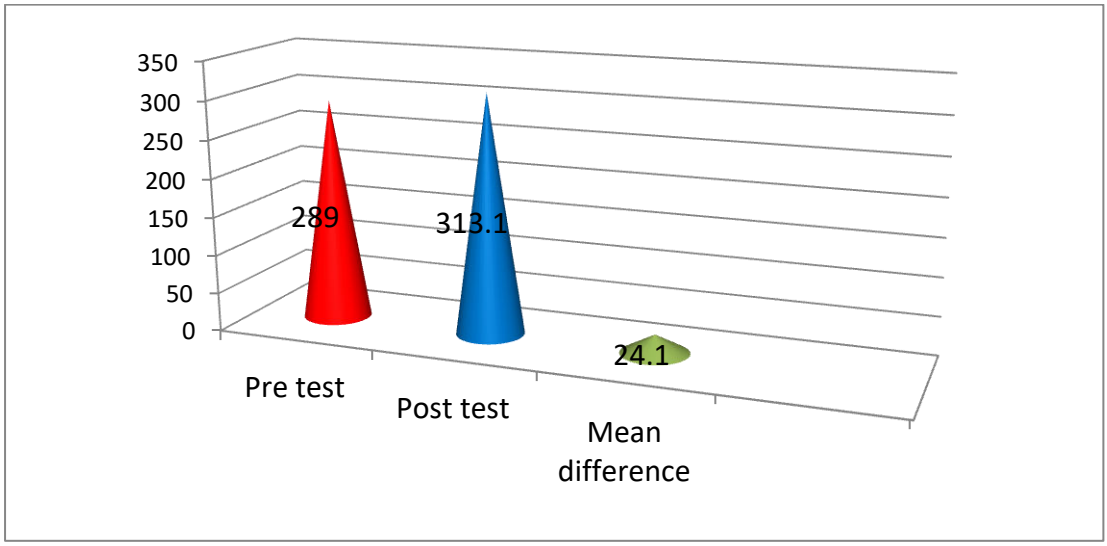
TABLE.5: Comparison of pre-test and post-test values of **scores of forced expiratory volume among group-B**

Group	Measurements	Mean	Mean difference	Standard deviation	Paired 't' test	Table 'p' value at 0.005
A	Pre test Post test	289 313.1	24.1	3.754	20.30	3.250

The above table shows that out of 10 samples, pre & post-test mean, mean difference, standard deviation,'t' value of asthma.

Hence alternative hypothesis was accepted

GRAPH .5: Comparison of pre-test and post-test values of **scores of forced expiratory volume among group-B**



Shows graphical representation of pre and post- test mean values of forced expiratory volume among Group B

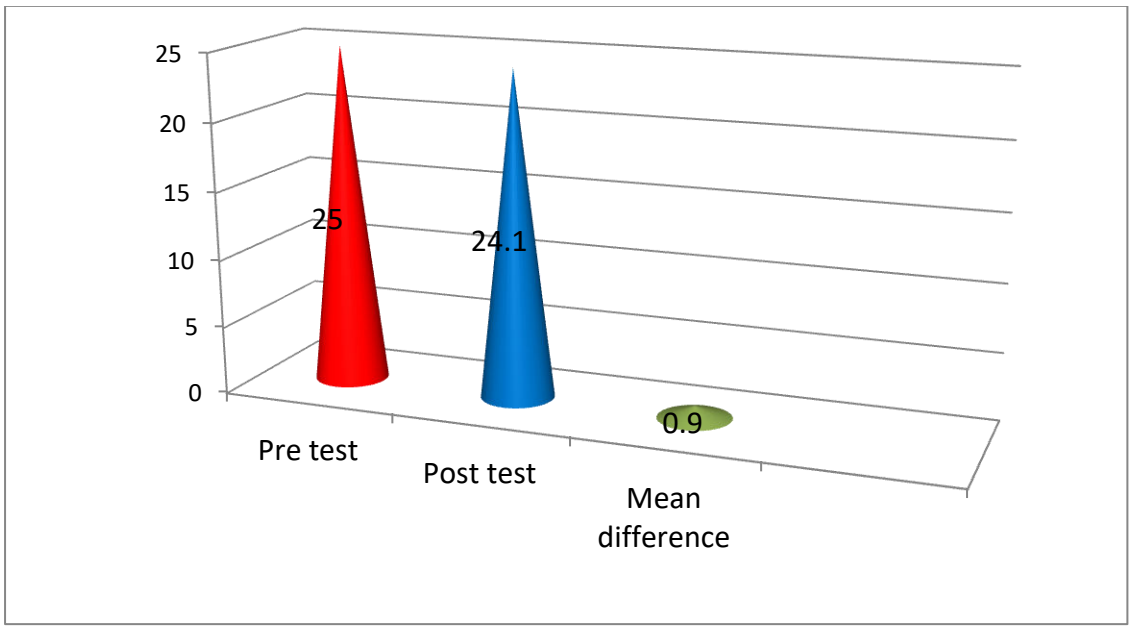
TABLE6: Mean value ofscores of forced expiratory volumebetween Group-A and Group- B

Groups	Mean	Mean difference	Standard deviation	Unpaired 't' test	Table 'p' value to 0.02
A	25	0.9	3.534	0.569	2.462
B	24.1				

The table shows that statistically difference in post-test values of asthma ($p<0.02$).

Hence unpaired "t" test shows comparative effects of Group A then Group B.

GRAPH 6: Mean value ofscores of forced expiratory volumebetween Group-A and Group- B



Shows graphical representation of un-paired‘t’ value of forced expiratory volume between Group A and Group B.

RESULTS

CHAPTER-V

RESULTS

A total number of 20 subjects of age group between 20 to 40 years with asthma were randomly selected for this study. They were divided into two groups such as group A treated withbuteyko breathing techniqueand group B treated with active cycle of breathing technique by random allocation method.

The subjects of both the group A and group B are given the treatment for a period of 6 week. Before the treatment the pre-test of Peak expiratory flow rate and Modified Borg's dyspnoea scale are measured. After 2 week of treatment the posttest values ofPeak expiratory flow rate and Modified Borg's dyspnoea scaleare measured.

The paired't' test was used to compare the pre-test and post-test values ofPeak expiratory flow rate and Modified Borg's dyspnoea scale for both groups. Based on the statistical analysis, the result of the present study shows that there is significant improvement in both group A and Group B following the effect ofbutekyo breathing.

Unpaired't' test was done between Group A and group B forPeak expiratory flow rate and Modified Borg's dyspnoea scale. The calculated unpaired't' values forPeak expiratory flow rateis 2.291 &Modified Borg's dyspnoea scaleis 0.569 which is greater than the table 'p' value 2.462.

DISCUSSION

CHAPTER -VI

DISCUSSION

The study was conducted on 20 subjects. The subjects were divided into two groups; Group A and Group B of 10 subjects in each group. Group A received Buteykobreathing and Group B received Active cycle of breathing technique.

The subjects of both the group A and group B are given the treatment for a period 2 weeks. Before the treatment the pretest of Peak expiratory flow rate and Modified Borg's dyspnoea scaleare measured. After 2week of treatment the posttest values of Peak expiratory flow rate and Modified Borg's dyspnoea scaleare measured.

The paired't' test was used to compare the pre-test and post-test values of Peak expiratory flow rate and Modified Borg's dyspnoea scalefor both groups. Based on the statistical analysis, the result of the present study shows that there is significant improvement in both group A and Group B following the effect ofButeykobreathing.

The Unpaired 't' test was used to compare the Group A and Group B based on the statistical analysis, the result of the present study shows that there is significant improvement in Group A treated with Buteykobreathing than group B treated with Active cycle of breathing technique.

Paired't' test was done for pre-test and post-test values forModified Borg's dyspnoea scale inButeykobreathing. The calculated't' value of group A is 16.8 which is greater than the tabulated value at 0.005 level of significance in reduction of score in post-test Modified Borg's dyspnoea scalein group A subjects treated withButeykobreathing.

Paired't' test was done for pre-test and post-test values forModified Borg's dyspnoea scale inButeykobreathing. The calculated't' value of group B is 10.11 which is greater than the tabulated value at 0.005 level of significance in reduction of score in post-test Modified Borg's dyspnoea scalein group B subjects treated withActive cycle of breathing technique.

Paired't' test was done for pre-test and post-test values forPeak expiratory flow rateinButeykobreathing. The calculated't' value of group A is 23.971 which is greater than the tabulated value at 0.005 level of significance in reduction of score in post-test Peak expiratory flow ratein group A subjects treated withButeykobreathing.

Paired‘t’ test was done for pre-test and post-test values forPeak expiratory flow rateinButeykobreathing. The calculated‘t’ value of group B is 20.30 which is greater than the tabulated value at 0.005 level of significance in reduction of score in post-test Peak expiratory flow ratein group B subjects treated withActive cycle of breathing technique.

Unpaired‘t’ test was done between Group A and Group B forModified Borg’s dyspnoea scale. The pre & post mean of group A is3.9, the pre and post mean of group B is 3.0 and the mean difference of group A and group B is0.9. The calculated ‘t’ value is 2.291is greater than the tabulated ‘t’ value at 0.005 level which shows reduction of dyspnoea in Group A subjects with Buteykobreathing when compared to Group B subjects with active cycle of breathing technique.

Unpaired‘t’ test was done between Group A and Group B forPeak expiratory flow rate. The pre & post mean of group A is25, the pre and post mean of group B is 24.1and the mean difference of group A and group B is0.9. The calculated ‘t’ value is 0.569is greater than the tabulated ‘t’ value at 0.005 level which shows reduction of dyspnoeain Group A subjects with Buteykobreathingwhen compared to Group B subjects withactive cycle of breathing technique.

The study aimed on comparing the effectiveness of buteyko breathing and pursed lip breathing on patients with asthma. The effectiveness of Butekyo breathing was earlier experimented by various therapists.

Robert L Cowie., (2007) conducteda randomised controlled trial of buteyko technique in a group of adults with asthma. The control group was trained by a physiotherapist in breathing and relaxation techniques. A single centre associated with a university based asthma programme. Asthma control, defined by composite score based on the Canadian asthma consensus report 6 months after completion of intervention. In the buteyko group the proportion with asthma control increased from 40% to 72%. They concluded that the butekyo breathing technique was more effective than the Active cycle of breathing technique.

Kolb *et al.,* (2003) conducted a study on 38 people with asthma aged between 18 and 70. Participants were followed for six months following the intervention. The BBT group exhibited a reduction in level of dyspnoea. They concluded and the results showed that the Buteyko breathing technique is safe and efficacious asthma management technique.

Hence, Hypothesis first and second was accepted and third was rejected.

CONCLUSION

CHAPTER- VII

CONCLUSION

A comparative study on effectiveness of buteyko breathing technique and Active cycle of breathing technique in the management of level of dyspnoea and forced expiratory volume among asthma patients

20 patients with asthma were included in this study and randomly divided into two groups A and B each group consist of 10 subjects. Group A was treated with butekyo breathing. Group B was treated with Active cycle of breathing technique. Level of dyspnoea and forced expiratory volume were assessed before and after intervention by modified Borg scale and peak expiratory flow meter

The statistical results show that there is improvement in both the groups. But when comparing both it was found that butekyo breathing is more effective thanActive cycle of breathing technique.

LIMITATIONS &RECOMMENDATION

CHAPTER-VIII

LIMITATION OF THE STUDY:

- The study was short term and therefore to make it more valid long term necessary.
- The study was limited with the specific age group 20 to 40years
- Since this study had been done with smaller number of subjects.
- Certain factors such as psychological status good not control during the period of study

RECOMMENDATIONS:

- Similar study can be done with longer duration.
- Similar study can be done with other age group.
- Similar study can be done with more number of subjects.

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CHAPTER- IX

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ANNEXURE

CHAPTER-X

ANNEXURE I

PHYSIOTHERAPY ASSESSMENT

Subjective assessment

- Name:
- Age:
- Sex:
- Occupation:
- Chief complaints:
- History
- Past medical history:
- Present medical history:
- Surgical history:
- Family history:
- History of allergy:
- Social history:
- Vital Signs
    - Blood Pressure
    - Heart Rate
    - Respiratory Rate
    - Pulse Rate
    - Temperature

Objective Assessment

On Observation

- Evaluation of general appearance
    - Consciousness
    - Body built
    - Posture
- Evaluation of extremity
    - Painful swollen joints
    - Tremor
    - Oedema
    - Clubbing
- Evaluation of head and neck
    - Facial appearance
    - Colour of mucous membrane
    - Facial colour
    - Size of neck veins
- External appearance
- Evaluation of unmoving chest
- Evaluation of moving chest
- Inspiratory and Expiratory ratio
- Evaluation of speech
- Cardinal symptoms

- Sputum
- Wheeze
- Dyspnoea

On Palpation

- Symmetry of chest
- Evaluation of chest motion
- Depth of excursion
- Fermitus

On percussion

On auscultation

Other areas for evaluation

- Shoulder
- Trunk
- Muscle strength
- Functional independence
- General endurance

ANNEXURE II

Peak expiratory flow rate

Zone	Reading	Description
Green Zone	80 to 100 percent of the usual or normal peak flow readings are clear.	A peak flow reading in the green zone indicates that the asthma is under good control.
Yellow Zone	50 to 79 percent of the usual or normal peak flow readings	Indicates caution. It may mean respiratory airways are narrowing and additional medication may be required.
Red Zone	Less than 50 percent of the usual or normal peak flow readings	Indicates a medical emergency. Severe airway narrowing may be occurring and immediate action needs to be taken. This would usually involve contacting a doctor or hospital.

ANNEXURE III

Modified Borg Dyspnoea Scale

0 Nothing at all

0.5 Very, very slight (just noticeable)

1 Very slight

2 Slight

3 Moderate

4 Somewhat severe

5 Severe

6

7 Very severe

8

9 Very, very severe (almost maximal)

10 Maximal

ANNEXURE IV

Table 1: Pre and post -test MBS score level of dyspnoea of Group A

SL.NO	PRE TEST	POST TEST
1	7	3
2	7	2
3	7	4
4	7	3
5	6	3
6	6	2
7	7	2
8	7	4
9	6	2
10	7	3

Table 2: Pre and post test MBS score level of dyspnoea of Group B

SL.NO	PRE TEST	POST TEST
1	7	5
2	6	2
3	7	3
4	6	2
5	7	4
6	6	3
7	7	5
8	6	2
9	7	5
10	7	5

Table 3: Pre and post-test scores of forced expiratory volume

SL. NO	PRE-TEST	POST-TEST
1	250	275
2	275	300
3	328	350
4	330	350
5	290	320
6	315	339
7	310	335
8	350	377
9	288	300
10	300	330

Table 4: Pre and post-test scores of forced expiratory volume

SL. NO	PRE-TEST	POST-TEST
1	252	272
2	312	342
3	300	325
4	290	312
5	315	335
6	350	375
7	286	310
8	270	300
9	265	285
10	250	275

ANNEXURE V

PATIENT CONSENT FORM

I …… voluntarily consent to participate in the research named on "A COMPARATIVE STUDY ON EFFECTIVENESS OF BUTEYKO BREATHING TECHNIQUE AND ACTIVE CYCLE OF BREATHING EXERCISE IN THE MANAGEMENT OF DYSPNOEA AMONG ASTHMA PATIENTS".

The researcher has explained me the treatment approach in brief, risk of participation and has answered the questions related to the study to my satisfaction.

Signature of patient **Signature of researcher**

Signature of witness

Place:

Date: